geology, as well as the common land of general periodical literature. The index of advances in physics required by a geologist will differ materially from that which meets the needs of a physicist.

John W. Evans.

Imperial College, South Kensington, June 12.

In the very interesting and important leader of your issue of June 9, dealing with the co-operative indexing of periodical literature, attention is mainly confined to the natural sciences, but whatever is said as to the necessity for some new co-operative effort there in order to render more accessible the contributions in what you call the non-homogeneous class of periodicals, the need is even greater in another field of knowledge. May I venture to point out that in the field of one of the political sciences, if history and its allied subjects can be included in such a term, co-operation is even more urgently needed, and may be profitably undertaken along similar lines and in close concert? In very few fields of historical investigation do workers possess the advantages that are afforded by comprehensive bibliographies of recent publications, and practically nowhere are there to be found abstracts such as are familiar to their colleagues in chemistry, physics, and other natural sciences. The "Lists of Writings on American History" that have been published since 1902 under the auspices of the American Historical Association, and the bibliography of "Publications relating to the History of Canada," published at Toronto, show that it is entirely practicable to undertake such work with success. At the approaching conference of Anglo-American Historians, to be held in the University of London on July 11–16, various schemes for co-operative effort are to be considered, and among them may possibly be projects for co-operative lists of periodical publications. It is hoped by many of those who are taking part in the conference that some concrete results will arise from these discussions. May I, therefore, suggest that when any steps are taken to summon a conference such as you propose for the extension of the bibliographical equipment of the sciences opportunities should be afforded to the historians to take part? It would be an inestimable boon if the principle of co-operative and co-ordinated action on common lines could be extended as widely as possible in the fields where the scientific method can be profitably employed.

Arthur Percival Newton.

University of London, King's College,
June 18.

I have read with great interest the leading article on "Co-operative Indexing of Periodical Literature" in Nature of June 9.

I have never been concerned with any work involving indexing of scientific periodicals, and those which have been my business, dealing with the classics, Oriental subjects, and bibliography, are essentially of the "watertight" character which present a much less serious problem to the student.

I think, however, there is one class of publication to which I should direct attention in connection with the subject of indexing for the use of present and future students, namely, official publications (Parliamentary papers, Stationery Office publications, reports of committees, etc.), which contain a great quantity of material which must necessarily be of value to investigators in various lines of research, and the lack of a clue to them is serious, especially as they are, from their quasi-anonymous nature, difficult to discover in the ordinary library catalogue.

If any conference such as that suggested in your article were called, I hope it would consider the indexing of these as well as of periodicals in the strict sense of the word. I do not think that any endowment will be forthcoming from public funds, but librarians in Government Departments and other Civil Servants with bibliographical interests would probably be willing to help in the work of compilation. I should certainly be prepared to make myself responsible for slips analysing the papers laid before Parliament by the Foreign Office.

June 11. Stephen Gaselee.

W. Warde Fowler: A Personal Appreciation.

All who know his "Tales of the Birds" will deplore the loss of this gifted observer and writer. My review—three and a half pages long!—of his charming booklet, "An Oxford Correspondence of 1903," under the title "Oxford on the Up Grade," in Nature, June 16, 1904, was the beginning of an all too infrequent correspondence. He was good enough to write that I had entered into the spirit of his views more than any other critic. They certainly appealed to me at the time; and to-day, when mere memorising and over-examination—including psycho-analysis—are becoming more and more of a curse and subversive of all mental progress, they merit the most careful consideration. Warde Fowler had cast off the blinkers worn usually by the literary man and could see widely. He could console his pupil's father for the son's failure in the I.C.S. examination by saying, "Never mind; he will do good work in life as soon as he recovers from the effects of his education."

In a postscript to his last letter to Jim Holmes, his young correspondent, he remarks:—

> I agree with what you said in your last letter about Greats. We had better grow our own plants instead of introducing exotics; but we must take care that our own plants get a real chance of coming to perfection.

Here the Oxford position is stated in a sentence; but the newer Universities are still more open to the implied criticism—as in all of them far too many things are attempted and the plants consequently are of stunted growth. In the interval, there has been advance at Oxford but not on an even grade; and the beer-point of enthusiasm (see my review) is not yet reached. So ineffective is the influence of its environment, that a professor, who over a long period had shut up the instruments of research in glass cases, into whose lap a great fortune had been dropped, could die recently without benefit to the University.

Take, too, his interesting quotation from Roger Ascham's "Scholemaster":—

> "All soch Authors as be fullest of good matter and right judgement in doctrine be likewise always most proper in wordes, most apte in sentence, *most plain and pure in uttering the same.*"

On this he makes the comment:—

> If I am not mistaken, this would have delighted Darwin.

This is not only a just recognition of Darwin's literary gift but should serve to confound Sir A. Quiller Couch and all those who presume to scoff at the literary shortcomings of scientific workers—without recognising how few literary men can be plain or pure in their utterance and how few either have

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matter to write about—rarely anything novel—or can produce doctrine worth consideration. Usually they are but dealers in hashed mutton; they may spice it pleasantly but it is still hash. "It is astonishing what nonsense able men will sometimes write, just because they don't know even the elementary laws of scientific investigation," said Warde Fowler.

I have a letter of his before me, from Kingham, Chipping Norton, dated July, 1913, acknowledging a pamphlet on Nature Study which I had sent to him:—

> I must confess (he writes) to an innate aversion from "Nature Study" in inverted commas and capital letters, *i.e.* as practised in too many schools, because I know that the teachers are quite ready to "teach" what they don't understand a bit and that the only person who can really help the children in these things is one who is learning himself all the time and learning not only from books but using them just as a help. I am very glad to see that you have the same kind of feeling.

Then he speaks of his work in the village school:—

> This week, for example, I have given away two copies of my recent book on this village (which is sought after in the village) as prizes for accounts of the growth of corn (which is growing all around us in different stages) from the seed to the fruit, with specimens. Two girls won the prizes and there were some dozen good answers. The boys seemed more interested in the processes of agriculture than in the growth of the plant and the boys are fewer in number than the girls. I myself have learnt much that I did not know before and so has the schoolmaster. They were all silent or in difficulties about the bloom of the corn and no wonder. What a number of beautiful and interesting things there are to be learnt about it. To-day I have been learning something about the corn smut and turned out a book about diseases of cereals which I had hardly opened since I wrote my "Roman Festivals" and wanted to know something about the robigo, for the Festival of Mildew (Robigalia). One wants a microscope, however, to interest children in such things as that.
>
> I feel as if I should like to go on talking to you but I must be content with thanking you for your reminiscence of my young friend Jim Holmes, for whom I still have a sneaking fondness, as the only (or almost the only) creature of my brain.

In the "Roman Festivals," a work of marvellous erudition and research, he devotes quite a long section to the discussion of the Robigalia and remarks that "the red mildew was at times so terrible a scourge that the Robigalia (April 25) must in early Rome, when the population lived on corn grown near the city, have been a festival of very real meaning. A red dog was sacrificed to Robigus, the spirit who works in mildew. Nowadays nothing that happens in agriculture is marked by sacrifice."

Whether we think of Warde Fowler as literary man or naturalist, however, for the man who could write:—

> I will tell you that the joy of discovering something that you did not know before is in my experience very great and that the joy of finding that so far as your knowledge goes no one ever found it out before is far greater,

we shall long keep a place in our memory. Oxford will best serve his memory by increasing the number who can have that joy, as to-day, it may be feared, we are farther off than we ever were from that "general and vehement spirit of search in the air," which Lord Morley long ago proclaimed to be our prime need: not a few schools, too, are aiming at a classical revival; the meaning of science is not yet with them generally.

H. E. A.

Ionisation Potential and the Size of the Atom.

It is known that there is for different elements a relation between the ionising potential and atomic volume, the one increasing as the other diminishes. Hughes in his book on "Photo-electricity" (p. 51) indicates that the work in removing an electron wholly from an atom might be expected to vary inversely as the radius. In other words, the ionising potential might be inversely proportional to the cube-root of the atomic volume.

Now W. L. Bragg, in the *Philosophical Magazine* (August, 1920), has given the diameters of atoms in Ångstrom units (10^{-8}cm.), on the assumption of close packing in crystal structure. The diameter which he determines is more strictly the distance from centre to centre of contiguous atoms of the same kind. The dimensions which he thus found are far smaller than those deduced from calculations by kinetic theory.

It appears desirable to make a comparison of the ionisation potentials (1) with the diameters as given by W. L. Bragg, and (2) with the cube-root of the atomic volume.

In the subjoined table the name of the element, the ionisation potential, and Bragg's diameter ($\times 10^8$), are set forth in the first three columns. The product of the diameter and ionising potential appear in the fourth column. The cube-root of the atomic volume is stated in the fifth column, and its product with the ionisation potential in the sixth column.

Group I.

I. Element	II. Ionisation potential	III. Diameter $\times 10^8$	IV. II. × III.	V. Cube root of atomic volume	VI. II. × V
Na	5·11	3·55	18·1	2·87	14·7
K	4·32	4·15	17·9	3·57	15·4
Rb	4·16	4·50	18·7	3·81	15·9
Cs	3·88	4·75	18·4	4·12	16·0
		Mean	18·3	Mean	15·5
		Range	0·8	Range	1·3
		Group II.			
Mg	7·61	2·85	21·7	2·40	18·3
Ca	6·09	3·40	20·8	2·96	18·0
Sr	5·67	3·90	22·2	3·25	18·4
Ba	5·19	4·20	21·8	3·31	17·2
		Mean	21·6	Mean	18·0
		Range	1·4	Range	1·2
		Group II.B.			
Zn	9·35	2·65	24·8	2·09	19·5
Cd	8·95	3·20	28·6	2·35	21·0
Hg	10·38			2·45	25·4
		Group III.B.			
Tl	7·3	4·50	32·8	2·58	18·8
		Group IV.B.			
Pb	7·93	3·80	30·1	2·63	20·8

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